

FINAL REPORT

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2022 IRIS Summary Data Report: For the Vision and Eye Health Surveillance System

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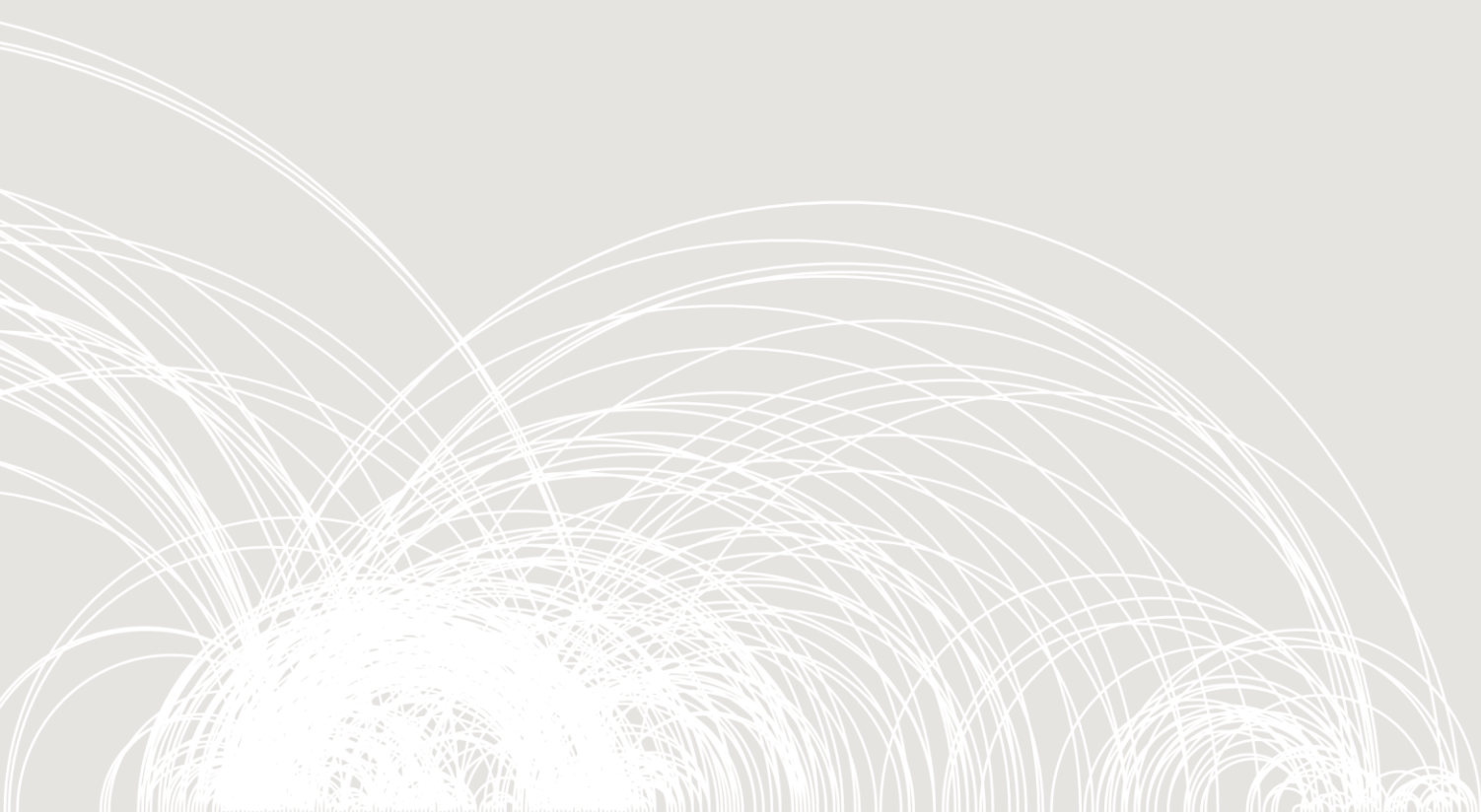


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Dataset Description

Compiled by the American Academy of Ophthalmology (AAO), IRIS® Registry (Intelligent Research In Sight) is the nation's first comprehensive eye disease clinical registry. The IRIS® Registry enables ophthalmologists to use clinical data to improve care delivery and patient outcomes and help practices meet requirements of the federal Physician Quality Reporting System (PQRS). The IRIS® Registry uses HIPAA-compliant methods to collect data from patient records directly from practices' individual EMR systems. These EMR systems periodically report health record data based on the IRIS® Registry data fields on a nightly or weekly basis. The system tracks diagnosed disorders based on ICD-9/ICD-10 codes and also includes procedures and visual acuity measures and other clinical data documented in the medical record. The main advantages of IRIS® Registry are its wide coverage and availability of diagnostic test results such as acuity values. However, IRIS® Registry is also a new data system and has not been externally evaluated for data completeness, reliability, or validity. The IRIS® Registry team has provided summary level frequencies and prevalence values to the VEHS system and has not granted access to person level data. This limits the ability of the VEHS team to assess the quality of IRIS® Registry data.

Analysis Overview

We analyzed IRIS® Registry data to estimate the annual prevalence rate of treated diagnoses, the rate of clinical procedures, and the prevalence rate of visual acuity values when reported, as observed over a single year of observations in the 2022 IRIS® Registry data. Under subcontract to NORC, AAO analyzed the 2022 IRIS® Registry and supplied reports of frequencies and rates, summarized by state and by age group, race/ethnicity, sex, and insurer. A detailed description of the analytical steps is described in the report "VEHS Claims & Registry Analysis Plan".

Data Indicators and Case Definitions

IRIS estimates include data indicators representing three topics of the overall VEHS project;

- Visual Function – Best-corrected acuity measures
- Medical Diagnoses – Medical conditions defined by ICD-10 code and classified into 17 main categories and 79 subgroups, as described in the report VEHS 'ICD9 and ICD10 Diagnosis Categories Report'
- Service Utilization – Medical procedures and encounters as defined by CPT code and service date were reported by AAO

Visual Function Topic

Visual Function measures currently include best-corrected visual acuity. In our initial analyses, acuity is defined categorically, and patients are divided into 8 subgroups based on acuity values contained in the IRIS data (Table 1).

Table 1. Visual Function Topic Variables

Category	Subgroup
Best-corrected Visual acuity	Normal vision
	Any vision loss ($\leq 20/32$ in better eye)
	Mild visual impairment ($20/32 - 20/63$ in better eye)
	Moderate visual impairment ($20/70 - 20/160$ in better eye)
	US blind ($\leq 20/200$ in better eye)
	WHO blind ($\leq 20/400$ in better eye)
	Monocular vision loss ($\leq 20/70$ in one eye with normal vision in the other)
	Missing acuity (patient has no valid acuity measure)

Acuity measures are based on each patient's last visual acuity observation in 2022, using their best-corrected acuity in the better-seeing eye. The prevalence rate of patients who exhibit moderate impairment in one eye with normal vision in the other are reported as having monocular vision loss.

Some IRIS Registry patients have no acuity values, necessitating the inclusion of a missing acuity category. It is unclear whether these missing values result from lack of measurement by the practice, data quality issues, or both. We anticipate that completeness of the patient acuity measures will increase over time. Additionally, IRIS Registry does not currently have a high proportion of presenting visual acuity or uncorrected acuity values. AAO suggests that the recording and reporting to IRIS Registry of such acuity values was still subject to significant uncertainty. We will continue to investigate the option of including such measures in future analyses.

Medical Diagnoses Topic

Medical Diagnoses are reported based on the VEHSS-defined medical diagnosis categorization structure. As reported in detail in the VEHSS Medical Diagnosis Categorization Report, we identified all eye and vision related ICD10 diagnosis codes and organized them into a 2-level categorization structure, including 17 Categories and 79 Subgroups, as listed in Table 2.

Table 2. Medical Diagnosis Categories by Clinical Subgroups

Category	Clinical Subgroup
Retinal Detachment and Defects	
Diabetic Eye Diseases	
	Early/mild diabetic retinopathy
	Moderate /severe non-proliferative diabetic retinopathy
	Proliferative diabetic retinopathy
	Diabetic macular edema (dme, csme)
	Other/unspecified diabetes related eye conditions
Age related macular degeneration (AMD)	
	AMD, unspecified
	Early AMD
	Dry-form AMD

Category	Clinical Subgroup
	GA, modifier for Dry-form
	Wet-form AMD
	CNV, modifier for Wet-form
Other Retinal Disorders	
	Retina vascular disease, occlusive (arterial, venous)
	Central retinal vein occlusion
	Branch retinal vein occlusion
	Central retinal arterial occlusion
	Branch retinal artery occlusion
	Retina vascular disease, non-occlusive
	Macular edema (if not diabetic)
	Hereditary chorioretinal dystrophy
	Myopic degeneration
	Other/unspecified retinal disorders
Glaucoma	
	Open-angle glaucoma
	Primary open-angle glaucoma
	Low-tension glaucoma
	Glaucoma suspect
	Primary angle-closure glaucoma
	Narrow-angle glaucoma
	Congenital glaucoma
	Neovascular glaucoma
	Other/unspecified glaucoma
Cataracts	
	Senile cataract
	Non-congenital cataract
	Congenital cataract
	Posterior capsular opacity
	Pseudophakia
	Aphakia and other disorders of lens
Disorders of Refraction and accommodation	
	Myopia
	Hypermetropia
	Astigmatism
	Presbyopia
	Other disorder of refraction and accommodation
Blindness and low vision	
	Unqualified visual loss, both eyes
	Unqualified vision loss in one eye, or unspecified visual loss
	Vision impairment one eye
	Moderate or severe vision impairment better eye; profound vision impairment of lesser eye

Category	Clinical Subgroup
	Moderate or severe vision impairment both eyes
	Profound vision impairment, bilateral, or legal blindness
Strabismus and amblyopia	
	Strabismus
	Amblyopia
Injury, burns and surgical complications of the eye	
	Injury
	Burn
	Surgical complication
Disorders of optic nerve and visual pathways	
	Optic nerve disorders
	Visual pathway disorders
Other visual disturbances	
	Visual field defect
	Color blindness
	Night blindness
	Other/unspecified visual disturbances
Infectious and Inflammatory diseases	
	Infectious diseases
	Keratitis
	Conjunctivitis
	Eyelid infection and inflammation
	Other inflammatory conditions
	Lacrimal system and orbit inflammation
	Endophthalmitis
Orbital and external disease	
	Congenital anomalies
	Other/unspecified orbital or external disease
	Lacrimal diseases
	Eyelid disorders
	Dry eye syndrome
	Disorders of the globe
Cancer and neoplasms of the eye	
	Malignant neoplasm of the eye
	Benign neoplasm of the eye
Cornea disorders	
	Keratoconus
	Endothelial dystrophy (inc Fuchs)
	Other corneal disorders
Other eye disorders	

Table 3. Medical Diagnosis Categories by Summary Subgroups
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Category	Summary Subgroup
Diabetic Eye Diseases	
	Non-vision threatening stage
	Vision threatening stage
All Age-related macular degeneration (AMD)	
	Non-vision threatening stage
	Vision threatening stage
All Glaucoma	
	Non-vision affecting glaucoma
	Vision affecting glaucoma
All Cataracts	
	Diagnosed untreated cataract
	Diagnosed treated cataract

Medical Diagnoses represent the prevalence of diagnosed eye diseases based on the defined categories and subgroups. Full details of the analysis approach are available in the “VEHSS Claims and Registry Analysis Plan” and were based on the methodology of the CMS Chronic Conditions Warehouse and supported by a literature review. In brief, the approach is as follows.

- Patients are assigned to a diagnosis subgroup if their IRIS Registry EMR indicates the presence of an ICD10 diagnosis code specified for inclusion.
- Only one instance of a code was required to classify the patient to a subgroup.
- Subgroups are mapped to diagnosis categories.
- Patients may be included in multiple subgroups within a category but will only be assigned to that overall category a single time. Thus, the sum of patients from the subgroups should total more than the total number of patients in the category that contains those subgroups since individual patients may be counted in more than one subgroup category.

For example, assume a patient has diagnosis codes for both strabismus and amblyopia. This patient would be counted once in the “Strabismus and Amblyopia” category but would be reported in both of the underlying subgroups of “Strabismus” and also “Amblyopia”. This same patient may also be included in other categories and subgroups.

The sample (denominator) of patients consists of the total number of current patients with an encounter with a IRIS-member provider during the year of observation.

Service Utilization Topic

Service Utilization measured in IRIS 2022 is the proportion of patients who received an included eyecare service per year of observation. The service utilization indicators are listed in Table 4.

Table 4. Service Utilization Topic Indicators

Category	Subgroup
Eye exams	By provider type
	By ophthalmologists and other physicians
	By optometrists and opticians
Screening	Any vision screening
	Glaucoma screening
	Telemedicine Screening
	Vision screening
Imaging or diagnostic test	Fluorescein angiography
	Corneal topography
	Electroretinography
	Stereo fundus exam
	Gonioscopy
	Optical coherence tomography
	Any diagnostic eye test
	Tonometry test
	Visual field testing
Vision Correction	Contact lens or fitting
	Eyeglasses
	Low Vision Aids
	Any vision correction
Refraction	Refraction
AMD Treatment	Anti-VEGF injections
	Laser surgery
	Photodynamic therapy
	Any AMD procedure
Cataract Surgery	Cataract surgery
	Any cataract treatment
Glaucoma Treatment	Drain
	Glaucoma surgery
	Laser surgery
	Glaucoma prescription drugs
	Any glaucoma treatment
Treatment for diabetic retinopathy	Laser/photocoagulation
	Retinal detachment repair
	Vitrectomy

	Anti-VEGF injections
	Any DR treatment
Treatment for RVO	Anti-VEGF injections
	Laser surgery
	Vitrectomy
	Steroid
	Any RVO treatment

Stratification Factors

We report the summary outcomes of each data indicator overall, and by the stratification factors age group, sex, race/ethnicity, and state. This report includes outcomes estimated for single levels of stratification. To estimate prevalence rates for specific multi-variable stratification categories, please visit the VEHSS data visualization application.

Age Groups

Beneficiary age was categorized into the VEHSS-defined major age groups: 0-17, 18-39, 40-64, 65-84, 85+.

Sex Categories

Beneficiaries were classified as either Male, Female, or Unknown.

Race/Ethnicity Categories

We used the VEHSS race/ethnicity identifiers. Few beneficiaries had missing race/ethnicity data and were excluded because their results would have been suppressed.

- American Indian and Alaska Native (AIAN)
- Asian
- Black (non-Hispanic)
- Hispanic (any race)
- White (non-Hispanic)
- Other (including multiple or missing race)
- Unknown
- All Races

States and Territories

Table 5. VEHSS State and Territory Abbreviations

AK	Alaska	LA	Louisiana	OK	Oklahoma
AL	Alabama	MA	Massachusetts	OR	Oregon
AR	Arkansas	MD	Maryland	PA	Pennsylvania
AS	American Samoa	ME	Maine	PR	Puerto Rico
AZ	Arizona	MH	Marshall Islands	PW	Palau
CA	California	MI	Michigan	RI	Rhode Island
CO	Colorado	MN	Minnesota	SC	South Carolina
CT	Connecticut	MO	Missouri	SD	South Dakota
DC	District of Columbia	MP	Northern Mariana Islands	TN	Tennessee
DE	Delaware	MS	Mississippi	TX	Texas
FL	Florida	MT	Montana	UT	Utah
GA	Georgia	NC	North Carolina	VA	Virginia
GU	Guam	ND	North Dakota	VI	U.S. Virgin Islands
HI	Hawaii	NE	Nebraska	VT	Vermont
IA	Iowa	NH	New Hampshire	WA	Washington
ID	Idaho	NJ	New Jersey	WI	Wisconsin
IL	Illinois	NM	New Mexico	WV	West Virginia
IN	Indiana	NV	Nevada	WY	Wyoming
KS	Kansas	NY	New York	XX	Missing State
KY	Kentucky	OH	Ohio	US	National

Suppression and Data Release Restrictions

To ensure patient privacy and protections, the VEHSS project implements additional data suppression on all publicly released data. All data incorporated into the VEHSS system is de-identified summary data. VEHSS does not report any patient-level data. To ensure maximum levels of data privacy and security, NORC worked with its internal data governance board, external experts and data providers to design suppression algorithms to balance high level patient protection while maintaining the utility of publicly released data. VEHSS employed the following data suppression algorithm for Medicare claims data:

1. Suppress rates and denominator when denominator < 11
2. Suppress rates if numerator < 3
3. Report rates to 4 digits, formatting as percentage with two decimal points.
4. For public data on the VEHSS Data Visualization Application and the Centers for Disease Control and Prevention (CDC) Open Data Platform, counts of less than 100 are rounded to the nearest 10, and counts of 100 or greater are rounded to the nearest 100.

Validation

Sample Description, Size, and Assumptions

Like all convenience samples, IRIS Registry suffers from non-response bias attributable to any systematic exclusion or over-representation of groups. As the size of convenience sample approaches the size of the population, the level of potential bias is reduced. Even within a convenience sample, estimates for individual population groups are valid in terms of representing members of the sample as long as care is taken to explain who is included in the sample and what the results can be said to represent. For some conditions and populations, IRIS Registry data may represent the first and only measurement of the condition that exists. IRIS Registry data can also be used in combination with other information to inform population estimates of eye condition prevalence rates. Finally, the sample size of IRIS Registry has the benefit of being large enough to allow for the reporting of results for most conditions, at most levels of stratification, without the need for data suppression for privacy protection.

Finally, we are unable to validate the quality of the underlying EMR data, nor the accuracy and efficacy of the process of mapping EMR records to IRIS Registry diagnostic and procedure information. However, the EMR data is the legal record of medical care, and it would be difficult to validate. The details of this process are not publicly released and, to our knowledge, have not been validated by outside experts.

Outcome Coverage

Examinations and Medical Diagnoses are coded if they are present, and thus we cannot determine if some patients are missing such information. However, based on our analysis IRIS Registry reports higher examination and diagnosis rates for Medicare patients than are observed in Medicare FFS claims which may mitigate this concern.

While AAO reported the proportion of IRIS patients who had eye care services, this rate is based on a denominator consisting of patients with an encounter with their ophthalmologist in the year of observation. Thus, this rate did not represent a population rate of eye exams, but rather the proportion of patients who had an eye care visit who were recorded as having a comprehensive eye exam. We will explore options for estimating population-level examination rates in future iterations of this analysis. Currently, we do not report these rates.

Potential Limitations

This analysis is subject to a number of potential limitations. Under contract to NORC, AAO analyzed 2022 IRIS Registry data for the VEHSS project. AAO reported summary outcome statistics based on VEHSS-defined data indicators and case definitions for visual function, eye examinations, and medical diagnoses. Some of the possible limitations include the following:

- NORC and VEHSS do not have access to patient level data nor details on the process of mapping EMR data to IRIS Registry. The quality of underlying EMR data, and the process of mapping EMR records to IRIS Registry could not be validated by the VEHSS team.
- IRIS Registry data represents a sample of current ophthalmology patients and should not be considered representative of the general population. IRIS Registry rates contained in this report are calculated on the basis of per 100 current ophthalmology patients and are not representative of the overall population.
- IRIS Registry does not include all ophthalmology practices and may be more likely to include practices who primarily serve Medicare patients because automated PQRS reporting is a motivating factor for providers to register with IRIS Registry. The IRIS Registry is a convenience sample and its representativeness of the population of all ophthalmology patients is still being studied.
- IRIS Registry only includes patients of ophthalmology practices. About 20% to 30% of providers in IRIS Registry are optometrists who work for mixed-provider practices participating in IRIS Registry.
- IRIS Registry includes services provided regardless of payer but cannot identify the payer of specific procedures.
- Eye examination rates are not reported due to the lack of a suitable denominator.

Summary Statistics

Table 6. Prevalence of Treated Medical Diagnoses by Clinical Subgroup, 2022

Subgroup	Prevalence (%)	Numerator
Sample Size = 20274700		
All Retinal detachment and defects	3.74	757700
All Diabetic eye diseases	6.30	1276500
Proliferative diabetic retinopathy	1.99	403700
Diabetic macular edema	2.81	570600
Other diabetes related eye disorders	0.55	111700
Non-proliferative	3.55	719400
Severe non-proliferative	0.62	125400
All Age-related macular degeneration (AMD)	13.27	2689600
Unspecified-age related macular degeneration	0.39	78700
Early stage age-related macular degeneration	3.41	691100
Dry-form age-related macular degeneration	8.65	1753700
Geographic atrophy	0.92	187400
Wet-form age-related macular degeneration	3.53	715400
Choroidal neovascularization	2.95	597900
Advanced GA or Inactive CNV	1.86	376300
All Other retinal disorders	21.11	4279800
Occlusive retinal vascular disease	0.05	10500
Central retinal vein occlusion	0.71	144200
Branch retinal vein occlusion	1.19	242300
Central retinal arterial occlusion	0.14	29400
Branch retinal artery occlusion	0.27	54200
Non-Occlusive retinal vascular disease	4.18	846900
Hereditary chorioretinal dystrophy	0.81	163700
Myopic degeneration	0.88	178800
Other/unspecified other retinal disorders	15.88	3219500
Retinopathy of prematurity	0.06	11800
Macular edema (Cystoid or non-diabetic)	0.99	200900
Any retinal artery occlusion	0.40	81900

Subgroup	Prevalence (%)	Numerator
Any retinal vein occlusion	1.85	374200
All Glaucoma	23.29	4721000
Open-angle glaucoma	8.83	1790300
Glaucoma suspect	13.36	2707800
Primary angle-closure glaucoma	2.25	455700
Other/unspecified glaucoma	1.05	212400
Secondary glaucoma	0.40	80600
Glaucoma, non-suspect	11.77	2386100
Glaucoma, suspect	13.36	2707800
All Cataracts	59.78	12119300
Congenital Cataract	0.22	44400
Posterior capsular opacity	9.89	2004300
Pseudophakia	26.71	5416300
Aphakia and disorders of lens	0.48	98200
Age-related cataract	38.88	7882700
Other or unspecified cataract	0.38	76900
Diagnosed untreated cataract	39.51	8010100
Diagnosed treated cataract	30.05	6091800
All Refraction and accommodation disorders	39.91	8091000
Myopia	15.78	3199300
Hypermetropia	8.12	1647100
Astigmatism	14.56	2952200
Presbyopia	18.98	3848000
Other refraction and accommodation disorders	2.45	497100
All Blindness and low vision	0.34	68900
Unqualified impairment, both eyes	0.01	2500
Unqualified impairment in one eye, or unspecified	0.14	28600
Low vision or blindness, one eye	0.10	19600
Blindness one eye, low vision other eye	0.02	4600
Low vision, both eyes	0.02	3100
Blindness, both eyes, including legal blindness	0.07	13600
All Strabismus and amblyopia	4.67	946500

Subgroup	Prevalence (%)	Numerator
Strabismus	2.79	564900
Amblyopia	2.36	479500
All Injury, burns and surgical complications of the eye	3.21	649800
Ocular injury	2.46	499000
Ocular burns	0.04	8200
Surgical complication of the eye	0.79	160000
All Disorders of optic nerve and visual pathways	2.42	490100
Optic nerve disorders	2.41	489100
Disorders of the visual pathway and visual cortex	0.01	1100
All Other visual disturbances	5.44	1101900
Visual field defect	0.79	159700
Color blindness	0.06	13100
Night blindness	0.40	80400
Other/unspecified visual disturbances	4.63	938600
All Infectious and inflammatory diseases	23.44	4753200
Infectious diseases	0.96	194600
Keratitis	7.31	1482100
Conjunctivitis	9.21	1868100
Eyelid infection and inflammation	8.27	1676900
Other/unspecified infectious and inflammatory diseases	1.78	360600
Lacrimal and orbit inflammation	0.15	29900
Endophthalmitis	0.19	38500
All Orbital and external disease	29.21	5921300
Congenital anomalies	0.66	133300
Other/unspecified orbital and external disease	0.21	42900
Lacrimal diseases	0.86	175100
Eyelid disorders	10.96	2222300
Dry eye syndrome	20.92	4242500
Disorders of the globe	0.12	24800
All Cancer and neoplasms of the eye diseases	4.11	833000
Malignant neoplasm	0.25	50500
Benign neoplasm	3.90	791100

Subgroup	Prevalence (%)	Numerator
All Cornea disorders	6.56	1330400
Keratoconus	0.60	120700
Endothelial dystrophy (Fuchs)	1.65	334200
Other corneal disorders	4.55	923200
Cornea disorder related to contact lens	0.08	17200
Corneal transplant	0.07	14000
All Other eye disorders	28.51	5779800

Table 8. Medical Diagnosis Categories by Age Group, 2022

	All Ages %	Numer ator	0-17 Years %	Numerator	18-39 Years %	Numerator	40-64 Years %	Numerator	65-84 Years %	Numerator	85 Above %	Numerator
	Sample Size = 20274700		Sample Size = 1112900		Sample Size = 1819200		Sample Size = 5820100		Sample Size = 9987000		Sample Size = 1535500	
All Retinal detachment and defects	3.74	757700	0.54	6000	2.90	52700	4.65	270700	3.93	392000	2.36	36200
All Diabetic eye diseases	6.30	1276500	0.03	310	2.28	41500	8.50	494800	6.75	674100	4.29	65800
All Age-related macular degeneration (AMD)	13.27	2689600	0.07	760	0.56	10200	4.26	248200	17.35	1733000	45.42	697500
All Other retinal disorders	21.11	4279800	4.20	46800	10.08	183400	18.03	1049400	25.56	2552700	29.15	447500
All Glaucoma	23.29	4721000	2.99	33300	9.45	171900	21.03	1224000	27.79	2775000	33.66	516900
All Cataracts	59.78	12119300	1.24	13800	5.12	93200	50.69	2949900	79.75	7964700	71.49	1097700
All Refraction and accommodation disorders	39.91	8091000	75.19	836700	60.94	1108700	45.22	2631700	31.47	3142500	24.18	371300
All Blindness and low vision	0.34	68900	0.30	3300	0.35	6400	0.33	19100	0.30	29500	0.69	10600
All Strabismus and amblyopia	4.67	946500	27.57	306800	5.46	99200	3.09	180000	3.11	311000	3.21	49300
All Injury, burns and surgical	3.21	649800	2.39	26600	4.85	88300	3.39	197600	2.89	288200	3.20	49200

	All Ages %	Numer ator	0-17 Years %	Numerator	18-39 Years %	Numerator	40-64 Years %	Numerator	65-84 Years %	Numerator	85 Above %	Numerator
complications of the eye												
All Disorders of optic nerve and visual pathways	2.42	490100	2.15	23900	3.32	60300	2.42	140900	2.24	223700	2.69	41300
All Other visual disturbances	5.44	1101900	7.30	81300	6.34	115400	5.09	296200	5.11	510100	6.44	98900
All Infectious and inflammatory diseases	23.44	4753200	16.60	184700	24.66	448700	24.82	1444500	23.12	2309400	23.83	365900
All Orbital and external disease	29.21	5921300	9.68	107700	18.31	333000	27.01	1571900	33.48	3343600	36.80	565000
All Cancer and neoplasms of the eye diseases	4.11	833000	1.01	11200	2.10	38100	3.84	223300	4.79	478200	5.35	82100
All Cornea disorders	6.56	1330400	1.20	13400	5.82	105900	5.75	334900	7.38	736800	9.08	139400
All Other eye disorders	28.51	5779800	3.74	41600	10.59	192700	23.89	1390100	36.00	3595600	36.45	559700

Table 9. Medical Diagnosis Categories by Sex, 2022

	Both sexes %	Numerator	Female %	Numerator	Male %	Numerator	Unknown %	Numerator
	Sample Size = 20274700		Sample Size = 11883100		Sample Size = 8318900		Sample Size = 72700	
All Retinal detachment and defects	3.74	757700	3.04	361000	4.72	392500	5.78	4200
All Diabetic eye diseases	6.30	1276500	5.25	624400	7.76	645300	9.29	6800
All Age-related macular degeneration (AMD)	13.27	2689600	14.01	1664500	12.18	1013100	16.63	12100
All Other retinal disorders	21.11	4279800	20.21	2401500	22.33	1857900	28.12	20400
All Glaucoma	23.29	4721000	22.83	2713200	23.92	1989500	25.15	18300
All Cataracts	59.78	12119300	59.56	7077500	60.04	4994300	65.31	47500
All Refraction and accommodation disorders	39.91	8091000	40.53	4815800	39.08	3250900	33.34	24200
All Blindness and low vision	0.34	68900	0.30	36200	0.39	32300	0.52	380
All Strabismus and amblyopia	4.67	946500	4.36	518500	5.10	424600	4.52	3300
All Injury, burns and surgical complications of the eye	3.21	649800	2.59	307900	4.07	338900	4.26	3100
All Disorders of optic nerve and visual pathways	2.42	490100	2.43	288900	2.39	199100	2.94	2100
All Other visual disturbances	5.44	1101900	5.44	646000	5.42	451200	6.61	4800
All Infectious and inflammatory diseases	23.44	4753200	24.62	2925200	21.76	1810000	24.83	18000
All Orbital and external disease	29.21	5921300	32.32	3840600	24.75	2058800	30.11	21900
All Cancer and neoplasms of the eye diseases	4.11	833000	4.08	484600	4.15	345300	4.36	3200
All Cornea disorders	6.56	1330400	6.49	771100	6.66	553800	7.63	5500
All Other eye disorders	28.51	5779800	29.10	3457800	27.62	2297800	33.24	24200

Table 10. Medical Diagnosis Categories by Race, 2022

	All Races %	N	North Amer ican Nativ e %	N	Asia n %	N	Black , non- Hispa nic %	N	Hispa nic, any race %	N	White, non- Hispani c %	N	Oth er %	N	Unk now n %	N
	Sample Size = 20274700		Sample Size = 60200		Sample Size = 563100		Sample Size = 1335600		Sample Size = 1297900		Sample Size = 11491200		Sample Size = 26400		Sample Size = 5500300	
All Retinal detachment and defects	3.74	757700	3.74	2300	4.53	25500	3.38	45100	3.66	47500	4.19	481400	3.51	930	2.82	154900
All Diabetic eye diseases	6.30	1276500	11.89	7200	7.63	43000	12.04	160900	12.95	168000	5.18	595200	13.33	3500	5.43	298800
All Age-related macular degeneration (AMD)	13.27	2689600	9.80	5900	11.82	66500	5.46	72900	9.04	117300	16.44	1889200	8.58	2300	9.74	535500
All Other retinal disorders	21.11	4279800	20.21	12200	24.91	140300	22.23	296800	21.90	284300	22.45	2579800	20.14	5300	17.47	961100
All Glaucoma	23.29	4721000	24.14	14500	30.91	174100	37.48	500600	26.78	347600	22.22	2553000	23.51	6200	20.45	1125100
All Cataracts	59.78	12119300	56.44	34000	57.09	321500	59.72	797600	53.47	694000	63.47	7293900	55.01	14500	53.89	2963800
All Refraction and accommodation disorders	39.91	8091000	43.77	26400	36.91	207800	36.40	486200	40.19	521700	40.10	4608100	43.59	11500	40.53	2229300
All Blindness and low vision	0.34	68900	0.43	260	0.32	1800	0.61	8200	0.45	5900	0.33	37700	0.46	120	0.27	14900
All Strabismus and amblyopia	4.67	946500	5.07	3100	3.53	19800	4.03	53900	4.98	64600	4.59	526900	4.01	1100	5.04	277100
All Injury, burns and surgical complications of the eye	3.21	649800	3.14	1900	2.58	14500	3.37	45000	3.44	44600	3.19	366200	3.09	820	3.21	176700
All Disorders of optic nerve and visual pathways	2.42	490100	2.39	1400	2.03	11400	3.07	41000	2.83	36800	2.40	276000	2.49	660	2.23	122800

	All Races %	N	North American Native %	N	Asian %	N	Black, non-Hispanic %	N	Hispanic, any race %	N	White, non-Hispanic %	N	Other %	N	Unknown %	N
All Other visual disturbances	5.44	110190	4.54	2700	6.09	34300	4.28	57200	4.77	61900	5.61	644700	6.18	1600	5.44	299400
All Infectious and inflammatory diseases	23.44	475320	20.95	12600	28.42	160000	23.13	308900	29.47	382500	22.32	2564800	25.70	6800	23.96	1317600
All Orbital and external disease	29.21	592130	24.53	14800	35.22	198300	26.52	354200	30.75	399200	29.79	3423400	25.91	6800	27.72	1524600
All Cancer and neoplasms of the eye diseases	4.11	833000	2.64	1600	1.71	9600	1.29	17300	2.58	33500	5.07	582200	2.25	590	3.42	188300
All Cornea disorders	6.56	133040	5.46	3300	5.45	30700	6.69	89300	6.34	82300	6.96	800300	5.75	1500	5.87	323000
All Other eye disorders	28.51	577980	25.09	15100	29.47	166000	23.18	309600	26.09	338600	31.34	3601300	24.26	6400	24.41	1342800

Table 11. Medical Diagnosis Categories by Risk Factors, 2022

	All Patients %	Numerator	Diabetes %	Numerator	Hypertension %	Numerator
	Sample Size = 20274700		Sample Size = 20274700		Sample Size = 20274700	
All Retinal detachment and defects	3.74	757700	0.73	148500	0.31	63400
All Diabetic eye diseases	6.30	1276500	6.29	1276100	0.80	162300
All Age-related macular degeneration (AMD)	13.27	2689600	2.91	589800	1.41	285300
All Other retinal disorders	21.11	4279800	5.65	1145500	2.23	453000
All Glaucoma	23.29	4721000	5.99	1214000	2.03	412400
All Cataracts	59.78	12119300	16.17	3278300	5.24	1063200
All Refraction and accommodation disorders	39.91	8091000	6.91	1400800	2.14	434800
All Blindness and low vision	0.34	68900	0.09	19000	0.03	7000
All Strabismus and amblyopia	4.67	946500	0.64	129100	0.24	48700
All Injury, burns and surgical complications of the eye	3.21	649800	0.60	121600	0.24	49200
All Disorders of optic nerve and visual pathways	2.42	490100	0.52	106100	0.21	42100
All Other visual disturbances	5.44	1101900	0.97	197200	0.43	86600
All Infectious and inflammatory diseases	23.44	4753200	4.46	904600	1.82	369900
All Orbital and external disease	29.21	5921300	6.25	1267100	2.45	497600
All Cancer and neoplasms of the eye diseases	4.11	833000	0.83	168500	0.37	75100
All Cornea disorders	6.56	1330400	1.29	261000	0.59	118900
All Other eye disorders	28.51	5779800	6.84	1386100	2.66	539000

Table 12. Medical Diagnosis Categories by Acuity, 2022

	Normal Vision %	Numerator	Visual Impairment %	Numerator	US Defined Blindness %	Numerator	Missing Acuity %	Numerator
	Sample Size = 18132800		Sample Size = 18132800		Sample Size = 18132800		Sample Size = 18132800	
All Retinal detachment and defects	2.68	486000	0.58	105300	0.06	11100	0.59	107500
All Diabetic eye diseases	3.64	659200	1.56	282600	0.13	23700	1.11	201200
All Age-related macular degeneration (AMD)	7.90	1431700	3.42	619400	0.37	66600	1.79	325200
All Other retinal disorders	14.29	2592000	4.03	730200	0.32	57900	3.14	568800
All Glaucoma	16.29	2954200	3.64	659700	0.29	52600	3.31	599800
All Cataracts	42.26	7663200	9.75	1767900	0.67	121100	8.11	1470100
All Refraction and accommodation disorders	32.06	5812700	4.05	735000	0.20	35600	4.23	767400
All Blindness and low vision	0.13	24500	0.10	18000	0.03	5500	0.06	10300
All Strabismus and amblyopia	3.06	555400	0.71	129300	0.05	8300	0.63	113600
All Injury, burns and surgical complications of the eye	1.92	347800	0.52	94300	0.06	10500	0.68	122800

	Normal Vision %	Numerator	Visual Impairment %	Numerator	US Defined Blindness %	Numerator	Missing Acuity %	Numerator
All Disorders of optic nerve and visual pathways	1.63	295100	0.40	72100	0.04	8100	0.36	65900
All Other visual disturbances	3.72	674600	0.84	152800	0.07	12600	0.86	155100
All Infectious and inflammatory diseases	16.14	2925800	2.92	528800	0.19	35000	4.17	755800
All Orbital and external disease	20.52	3720000	3.85	697800	0.24	43900	4.72	856200
All Cancer and neoplasms of the eye diseases	3.00	543400	0.50	90000	0.03	5500	0.66	119600
All Cornea disorders	4.37	791800	1.36	246400	0.11	19800	0.79	143100
All Other eye disorders	19.86	3601100	4.51	817500	0.31	56600	4.46	808100

Table 13. Service Utilization by Age, 2022

	All Ages %	Numerator	0-17 Years %	Numerator	18-39 Years %	Numerator	40-64 Years %	Numerator	65-84 Years %	Numerator	85 Above %	Numerator
	Sample Size = 22171600		Sample Size = 1260300		Sample Size = 1963600		Sample Size = 6316400		Sample Size = 10928900		Sample Size = 1702300	
Eye Exams by any provider type	94.94	21050800	93.57	1179300	93.71	1840000	95.05	6004000	95.25	10409300	95.05	1618100
Refraction	38.90	8625500	65.16	821300	49.10	964100	41.00	2589500	34.51	3772100	28.11	478500
Any vision screening	0.29	63900	0.18	2300	0.15	3000	0.21	13500	0.36	39600	0.32	5400
Any diagnostic eye test	47.06	10433800	7.26	91500	25.39	498500	43.61	2754700	54.83	5992300	64.43	1096900
Any vision correction	9.29	2060000	18.47	232800	23.50	461400	12.03	760100	4.99	545400	3.54	60300

Table 14. Service Utilization by Sex, 2022

	Both sexes %	Numerator	Female %	Numerator	Male %	Numerator	Unknown %	Numerator
	Sample Size = 22171600		Sample Size = 13017100		Sample Size = 9077400		Sample Size = 77200	
Eye Exams by any provider type	94.94	21050800	94.96	12361100	94.91	8615400	96.26	74300
Refraction	38.9	8625500	39.72	5170900	37.78	3429200	32.94	25400
Any vision screening	0.29	63900	0.29	37900	0.28	25600	0.49	380
Any diagnostic eye test	47.06	10433800	46.51	6054200	47.77	4336000	56.44	43600
Any vision correction	9.29	2060000	10.05	1308200	8.23	747500	5.63	4300

Table 15. Service Utilization by Race, 2022

	All race s %	Num erat or	North American Native %	Num erat or	White, non- Hispanic %	Num erat or	Asi an %	Num erat or	Black, non- Hispanic %	Num erat or	Hispanic, any race %	Num erat or	Oth er %	Num erat or	Unkn own %	Num erat or
	Sample size = 22171600		Sample size = 60800		Sample size = 12626300		Sample size = 628400		Sample size = 1499300		Sample size = 1444300		Sample size = 28700		Sample size = 5883800	
Eye Exams by any provider type	94.9 4	2105 0800	93.65	5690 0	94.77	1196 6000	94. 93	5965 00	93.28	1398 500	95.34	1377 000	93. 98	2700 0	95.67	5628 800
Refraction	38.9	8625 500	38.27	2330 0	40.17	5072 000	32. 96	2071 00	35.37	5303 00	37.91	5475 00	42. 67	1230 0	37.95	2233 000
Any vision screening	0.29	6390 0	0.08	50	0.19	2360 0	0.1 9	1200	0.24	3500	1.71	2470 0	0.3 5	100	0.18	1070 0
Any diagnostic eye test	47.0 6	1043 3800	48.33	2940 0	47.69	6021 100	54. 48	3423 00	54.42	8160 00	49.68	7175 00	48. 14	1380 0	42.38	2493 700
Any vision correction	9.29	2060 000	10.53	6400	9.97	1259 100	7.3 1	4590 0	7.84	1176 00	9.61	1388 00	11. 6	3300	8.31	4889 00

Table 16. Service Utilization by Diabetes and Hypertension, 2022

	Diabetes %	Numerator	Hypertension %	Numerator
	Sample Size = 22171600			
Eye Exams by any provider type	17.48	3874800	4.6	1020600
Refraction	6.24	1383100	1.57	347800
Any vision screening	0.11	25400	0.02	4900
Any diagnostic eye test	11.28	2502000	3.01	667700
Any vision correction	0.91	201200	0.22	48100

Table 17. Service Utilization by AMD, 2022

	AMD %	Numerator	Diabetes and AMD %	Numerator	Hypertension and AMD %	Numerator
	Sample Size = 22171600					
Any age related macular degeneration treatment	2.22	492800	0.49	109100	0.26	57700
Any cataract treatment	1.12	247400	0.23	50000	0.09	19000
Any diabetic retinopathy treatment	2.34	519000	0.52	115100	0.27	60500
Eye Exams by any provider type	10.62	2353600	2.33	516600	0.98	217600
Any glaucoma treatment	0.12	27300	0.03	6100	0.01	2900
Refraction	3.15	698600	0.69	152700	0.25	55000
Any RVO treatment	2.31	513200	0.52	114500	0.27	60200
Any vision screening	0.03	6200	0.01	2000	0.00	940
Any diagnostic eye test	8.97	1989000	1.99	441500	0.84	186900
Any vision correction	0.43	95900	0.09	19300	0.03	6300

Table 18. Service Utilization by Cataract, 2022

	Cataract %	Numerator	Diabetes and cataract %	Numerator	Hypertension and cataract %	Numerator
	Sample Size = 22171600					
Any age related macular degeneration treatment	3.23	717100	1.48	328900	0.43	94300
Any cataract treatment	7.82	1734700	1.87	414800	0.50	110300
Any diabetic retinopathy treatment	4.12	913400	1.74	386000	0.51	112300
Eye Exams by any provider type	47.50	10532100	12.92	2863900	3.43	759400
Any glaucoma treatment	0.81	178800	0.21	45900	0.06	13900
Refraction	18.05	4002500	4.57	1012800	1.13	251600
Any RVO treatment	3.84	851900	1.72	381100	0.49	109600
Any vision screening	0.22	48400	0.10	22500	0.02	4400
Any diagnostic eye test	28.15	6242300	8.45	1873200	2.33	516800
Any vision correction	2.79	617600	0.59	130400	0.15	33300

Table 19. Service Utilization by Diabetic Retinopathy, 2022

	DR %	Numerator	Diabetes and DR %	Numerator	Hypertension and DR %	Numerator
	Sample Size = 22171600					
Any age related macular degeneration treatment	1.47	326300	1.47	326300	0.19	41800
Any cataract treatment	0.46	102700	0.46	102700	0.05	11500
Any diabetic retinopathy treatment	1.70	377100	2.31	511300	0.62	137000
Eye Exams by any provider type	5.05	1120700	5.05	1120500	0.58	129600
Any glaucoma treatment	0.07	15500	0.07	15500	0.01	2100
Refraction	1.07	238200	1.07	238100	0.11	25100
Any RVO treatment	1.71	378300	1.71	378300	0.22	49100
Any vision screening	0.03	6200	0.03	6200	0.00	1000
Any diagnostic eye test	4.46	989400	4.46	989300	0.52	116000
Any vision correction	0.15	32900	0.15	32900	0.01	3100

Table 20. Service Utilization by Glaucoma, 2022

	Glaucoma %	Numerator	Diabetes and glaucoma %	Numerator	Hypertension and glaucoma %	Numerator
	Sample Size = 22171600					
Any age related macular degeneration treatment	1.00	222500	0.47	104700	0.14	31600
Any cataract treatment	1.84	408200	0.48	105800	0.14	30600
Any diabetic retinopathy treatment	1.23	273100	0.55	121100	0.17	36900
Eye Exams by any provider type	18.70	4145100	4.82	1068600	1.38	305300
Any glaucoma treatment	1.01	224900	0.27	59400	0.08	18400
Refraction	6.04	1339900	1.47	325300	0.39	86700
Any RVO treatment	1.20	266800	0.55	121600	0.17	37100
Any vision screening	0.09	21000	0.04	8600	0.01	1600
Any diagnostic eye test	15.82	3508600	4.19	929500	1.19	263400
Any vision correction	0.97	214400	0.19	43000	0.05	11100

Table 21. Service Utilization by Retinal Vein Occlusion, 2022

	Any RVO %	Numerator	Diabetes and RVO %	Numerator	Hypertension and RVO %	Numerator
	Sample Size = 22171600					
Any age related macular degeneration treatment	0.71	156800	0.22	48200	0.11	24400
Any cataract treatment	0.11	23400	0.03	7500	0.02	3400
Any diabetic retinopathy treatment	0.75	165300	0.23	51100	0.12	25900
Eye Exams by any provider type	1.51	335700	0.45	99400	0.23	50100
Any glaucoma treatment	0.03	7100	0.01	2400	0.00	1000
Refraction	0.25	55000	0.08	16900	0.03	7700
Any RVO treatment	0.76	168400	0.23	52000	0.12	26400
Any vision screening	0.00	1100	0.00	510	0.00	220
Any diagnostic eye test	1.45	321700	0.43	95500	0.22	48400
Any vision correction	0.04	8200	0.01	2300	0.00	1000

Table 22. Acuity by Age, 2022

	All Ages %	Numer ator	0-17 Years %	Numer ator	18-39 Years %	Numer ator	40-64 Years %	Numer ator	65-84 Years %	Numer ator	85 Above %	Numer ator
	Sample Size = 20613800		Sample Size = 1080700		Sample Size = 1901900		Sample Size = 5934800		Sample Size = 10139500		Sample Size = 1556900	
Any vision loss	13.68	281910 0	8.57	92600	5.34	101600	8.39	498100	15.55	157690 0	35.32	549900
Mild visual impairment	11.42	235490 0	7.32	79100	4.13	78500	6.87	407800	13.45	136330 0	27.38	426300
Moderate visual impairment	1.33	273300	0.88	9500	0.70	13400	0.90	53500	1.28	129900	4.30	67000
Monocular vision loss	14.18	292330 0	7.91	85500	6.59	125300	11.13	660700	17.29	175290 0	19.19	298800
Normal vision	70.94	146233 00	67.25	726700	77.86	148090 0	75.48	447940 0	70.42	713980 0	51.16	796500
US-defined blindness	0.93	190900	0.37	4000	0.51	9800	0.62	36800	0.83	83700	3.64	56600
Visual impairment	12.75	262820 0	8.20	88600	4.83	91900	7.77	461200	14.73	149320 0	31.68	493300
WHO-defined blindness	0.36	73800	0.11	1100	0.20	3800	0.24	14100	0.30	30800	1.54	24000
Missing acuity	15.38	317140 0	24.18	261400	16.79	319400	16.13	957300	14.03	142270 0	13.52	210600

Table 23. Acuity by Sex, 2022

	Both sexes %	Numerator	Female %	Numerator	Male %	Numerator	Unknown %	Numerator
	Sample Size = 20613800		Sample Size = 12110200		Sample Size = 8431000		Sample Size = 72600	
Any vision loss	13.68	2819100	14.05	1702000	13.09	1104000	18.02	13100
Mild visual impairment	11.42	2354900	11.78	1426700	10.88	917700	14.54	10600
Moderate visual impairment	1.33	273300	1.34	161700	1.31	110100	2.00	1500
Monocular vision loss	14.18	2923300	14.01	1697100	14.40	1214100	16.64	12100
Normal vision	70.94	14623300	71.46	8653600	70.23	5921300	66.67	48400
US-defined blindness	0.93	190900	0.94	113700	0.90	76200	1.48	1100
Visual impairment	12.75	2628200	13.12	1588400	12.19	1027800	16.55	12000
WHO-defined blindness	0.36	73800	0.37	44600	0.34	28800	0.59	430
Missing acuity	15.38	3171400	14.49	1754600	16.67	1405700	15.31	11100

Table 24. Acuity by Race, 2022

	All Race s %	Num erat or	North American Native %	Num erat or	Asi an %	Num erat or	Black, non- Hispanic %	Num erat or	Hispanic, any race %	Num erat or	White, non- Hispanic %	Num erat or	Oth er %	Num erat or	Unkn own %	Num erat or
	Sample Size = 20613800		Sample Size = 59200		Sample Size = 584000		Sample Size = 1389600		Sample Size = 1336300		Sample Size = 11736100		Sample Size = 27600		Sample Size = 5481100	
Any vision loss	13.68	2819 100	14.38	8500	14. 62	8540 0	14.87	2067 00	17.05	2278 00	13.54	1588 700	12. 94	3600	12.74	6985 00
Mild visual impairment	11.42	2354 900	11.76	7000	12. 62	7370 0	12.12	1684 00	14.12	1887 00	11.30	1325 600	10. 72	3000	10.74	5886 00
Monocular vision loss	14.18	2923 300	14.32	8500	13. 56	7920 0	13.71	1905 00	14.36	1919 00	15.04	1765 400	12. 82	3500	12.49	6844 00
Normal vision	70.94	1462 3300	68.17	4030 0	67. 63	3949 00	69.08	9599 00	66.32	8862 00	72.76	8538 800	68. 99	1900 0	69.04	3784 200
US-defined blindness	0.93	1909 00	0.98	580	0.7 2	4200	1.17	1620 0	1.16	1550 0	0.95	1113 00	0.8 6	240	0.78	4290 0
Visual impairment	12.75	2628 200	13.4	7900	13. 9	8120 0	13.71	1905 00	15.89	2123 00	12.59	1477 400	12. 08	3300	11.96	6556 00
WHO- defined blindness	0.36	7380 0	0.35	210	0.2 4	1400	0.46	6400	0.44	5800	0.37	4350 0	0.2 4	70	0.30	1640 0
Moderate visual impairment	1.33	2733 00	1.64	970	1.2 8	7500	1.59	2210 0	1.77	2360 0	1.29	1518 00	1.3 7	380	1.22	6690 0
Missing acuity	15.38	3171 400	17.45	1030 0	17. 75	1036 00	16.05	2230 00	16.64	2223 00	13.71	1608 600	18. 07	5000	18.22	9985 00

Table 25. Acuity by Risk Factors, 2022

	All Patients %	Numerator	AMD %	Numerator	Cataract %	Numerator	Diabetes %	Numerator	DR%	Numerator	Glaucoma %	Numerator	Hypertension %	Numerator	Any Retinal Vein Occlusion %	Numerator
Sample Size = 20613800																
Any vision loss	13.68	2819100	3.33	686000	9.16	1889000	3.69	761200	1.49	306300	3.46	712200	0.99	204200	0.42	85700
Mild visual impairment	11.42	2354900	2.60	535900	7.70	1587500	3.07	632300	1.19	246100	2.85	587600	0.80	165200	0.33	68400
Moderate visual impairment	14.18	2923300	0.41	83500	0.88	180400	0.37	76700	0.18	36500	0.35	72100	0.11	22100	0.05	990
Monocular vision loss	70.94	14623300	2.39	493200	9.39	1936400	3.25	670500	1.07	220400	3.44	708700	0.86	176900	0.47	97700
Normal vision	0.93	190900	6.95	1431700	37.17	7663200	12.96	2671600	3.20	659200	14.33	2954200	3.42	705600	1.05	216400
US-defined blindness	12.75	2628200	0.32	66600	0.59	121100	0.25	52300	0.12	23700	0.25	52600	0.08	16800	0.04	740
Visual impairment	0.36	73800	3.00	619400	8.58	1767900	3.44	709000	1.37	282600	3.20	659700	0.91	187300	0.38	78300
WHO-defined blindness	1.33	273300	0.13	26500	0.22	45600	0.09	19500	0.04	830	0.10	21200	0.03	640	0.01	290
Missing acuity	15.38	3171400	1.58	325200	7.13	1470100	3.00	619400	0.98	201200	2.91	599800	0.86	177300	0.23	47800